521 M7280 – SATELLITE GEODESY

SPRING SEMESTER 2017

Lab No. 2

handed out Wednesday, March 08, 2017
due Wednesday, March 15, 2017 09:10 **Name:** ______________________

From Cartesian to Spherical Coordinates

1. Use the 3-D coordinates (xo, yo, zo) you generated in Lab 1 as ECEF coordinates to compute their coordinates:

   a. in a global spherical reference frame (latitude, longitude, height).
   b. in a local Cartesian reference frame (e, n, u) (define **an arbitrary point on the Earth's surface** as your local origin).
   c. in a local spherical reference frame (Az, El, Sr).

   List your results in a table form with 13 columns (Pt_ID xo, yo, zo, lat, lon, ht, e, n, u, Az, El, Sr).

2. Save your output from part 1a to a **data file** (ASCII). Then write a code to read this as an input file and compute backward their ECEF coordinates (x, y, z).

   a. List your results in another table with 7 columns (Pt_ID, xo, yo, zo, x, y, z).
   b. Compute the difference between (xo, yo, zo) and (x, y, z).

3. Discuss your results (for instance, what causes the difference (if any) in part 2b?).

Use for $\boldsymbol{GM} = 398600.4418\left(\mathrm{km^3/s^2}\right)$, $\omega_{\boldsymbol{e}}^{*} = 7292115.8553 \times 10^{-11}\left(\mathrm{rad/s}\right)$, $\omega_{\boldsymbol{e}} = 7292115 \times 10^{-11}\left(\mathrm{rad/s}\right)$, and $\boldsymbol{R} = 6371.000000\left(\mathrm{km}\right)$.

Your (individual) final report should contain (use A4 papers):

- this page as the cover sheet
- source code(s) and outputs; do not forget to add your name and lots of comment cards to the source listing (% ....)
- input and output files from program [input/output values used and calculated], if any
- plots, including captions on axes, title, your name, LB#/HM#, course title, date (if any)
- derivation and description of formulas used, accompanied by figures where applicable
- evidence of computational accuracy
- discussion of results